DISTRIBUTION TUTORIAL

Product Integrity During Movement

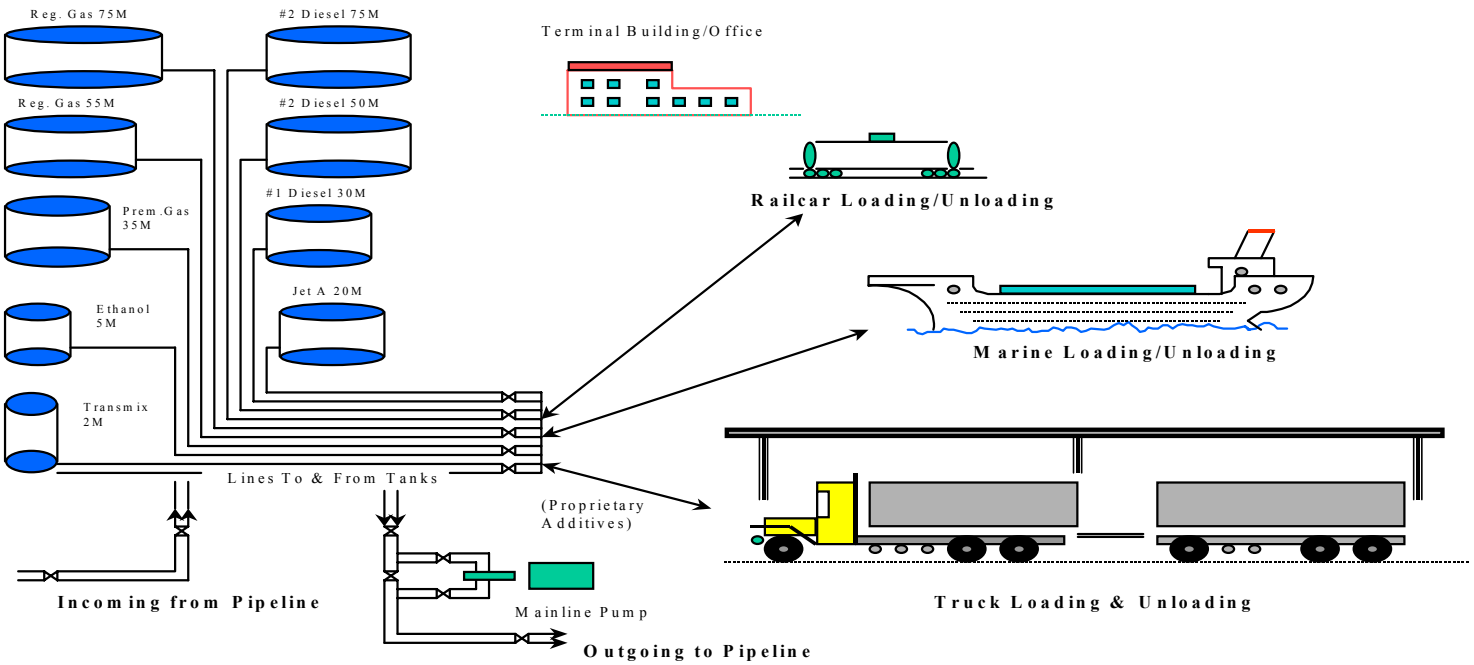
- **Different product batches are "pushed" through the system abutting each other. The product is kept in turbulent flow to minimize interfaces, the mixing zone between batches.**

Reformulated regular gasoline | **Low sulfur diesel fuel** | **Kerosene / Jet Fuel** | **High Sulfur Diesel** | **Conventional regular gasoline** | **All premium grades** | **Reformulated regular gasoline**

- **Pipelines use optimum sequencing of product grades to reduce the potential for contamination and/or downgrading of the products transported.**

REFINING AND DISTRIBUTION TUTORIAL

Typical Products Terminal

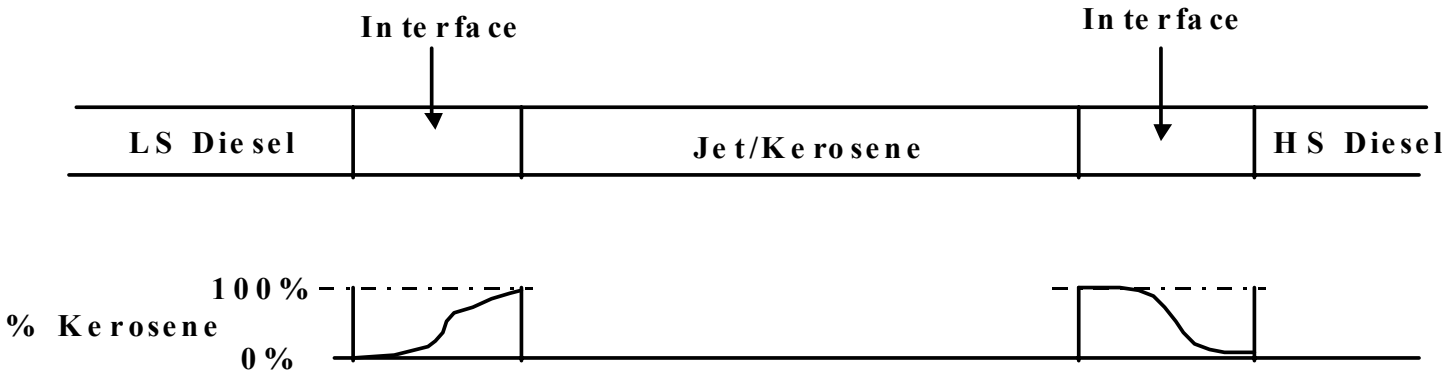


10/27/1999

DISTRIBUTION TUTORIAL

Product Integrity During Movement - Handling Procedures

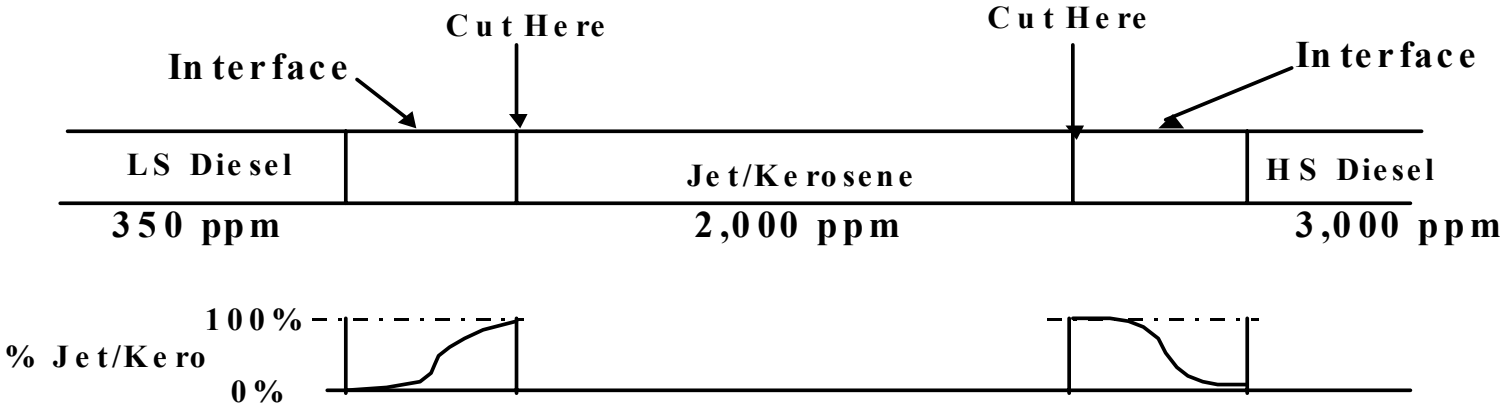
- Example: Low Sulfur Diesel, Jet/Kerosene, and High Sulfur Diesel:



DISTRIBUTION TUTORIAL

Product Integrity -Current Diesel Handling Procedures

- Example: Jet/Kerosene, High Sulfur Diesel and Low Sulfur Diesel:
  Cuts are made to preserve Jet/Kerosene quality
  Interface is delivered with preceding and following batches of LSD and HSD into tankage
  Sulfur in interface can be put into LSD and still remain on spec

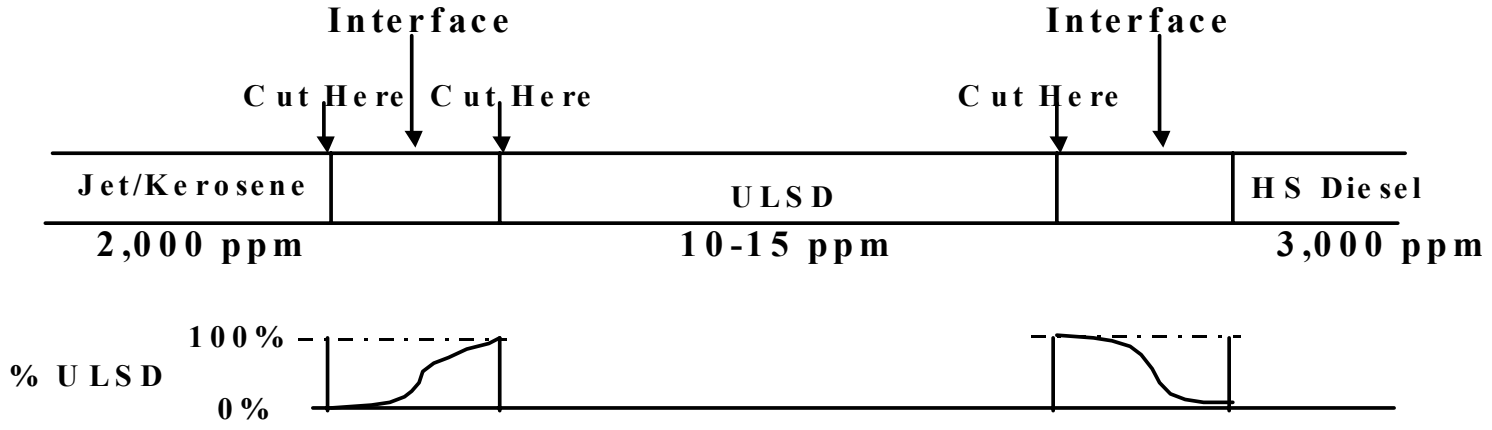


Interfaces are lost from Jet/Kerosene and gained by LSD and HSD batches

DISTRIBUTION TUTORIAL

Product Integrity –Future ULSD Handling Procedures w/HSD

- Example: Jet/Kerosene, ULSD and High Sulfur Diesel:
  Cuts are made to preserve Jet/Kerosene and ULSD quality
  Jet/ULSD Interface must be removed, ULSD/HSD Interface can be delivered with HSD batch into tankage
  Sulfur in interface can <u>not</u> be put into ULSD and still remain on spec

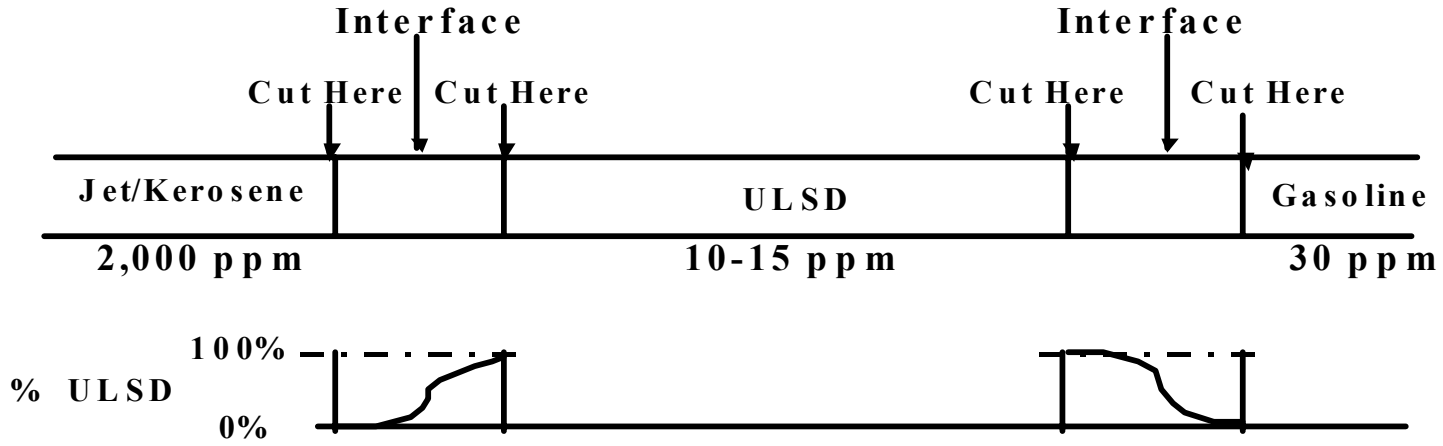


Interfaces are lost from ULSD and Jet/Kero batches
Interface is gained in HSD batch,
Jet/ULSD interface must be removed and put into HSD tank

DISTRIBUTION TUTORIAL

Product Integrity –Future ULSD Handling Procedures w/o HSD or LSD

- Example: Jet/Kerosene, ULSD and Gasoline:
  Cuts are made to preserve Jet/Kerosene and ULSD quality
  Jet/ULSD Interface must be removed,
  ULSD/Gasoline interface must be removed
  Both Interfaces must be reprocessed



Interfaces are lost from ULSD, Jet/Kero and gasoline batches

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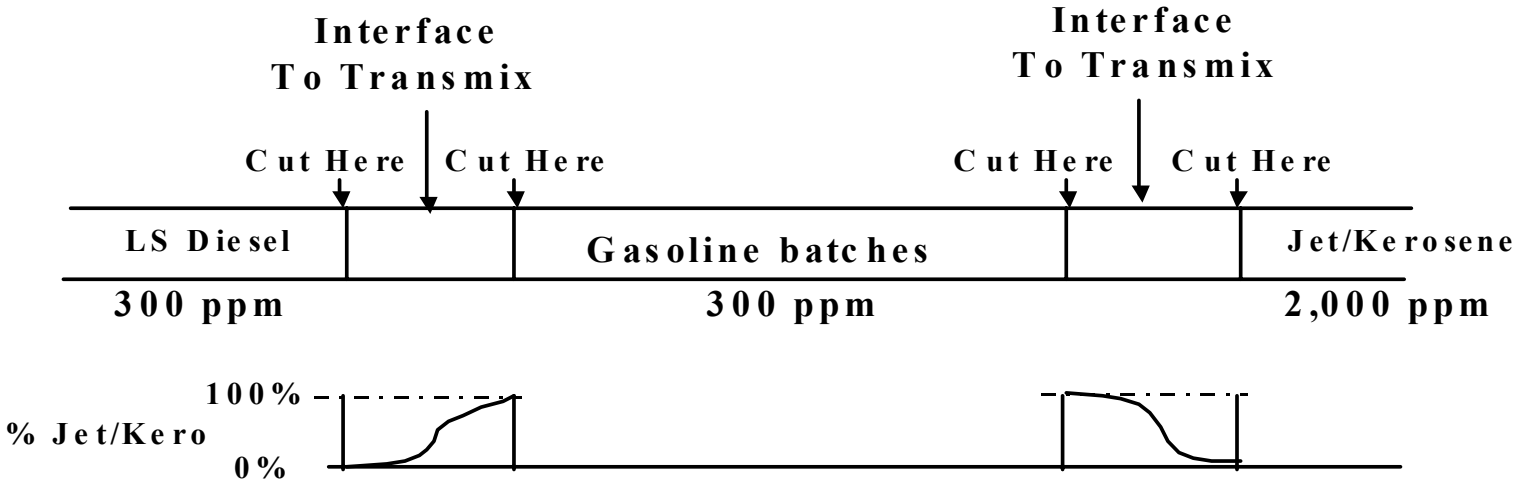
Product Integrity -Current Diesel/Gasoline Handling Procedures

- **Example: Jet/Kerosene, Gasoline and Low Sulfur Diesel:**
  Cuts are made to preserve Gasoline and Diesel quality
  Gasoline/Diesel Interface (Transmix) must be removed
  Small amounts of Transmix can be reblended into Gasoline

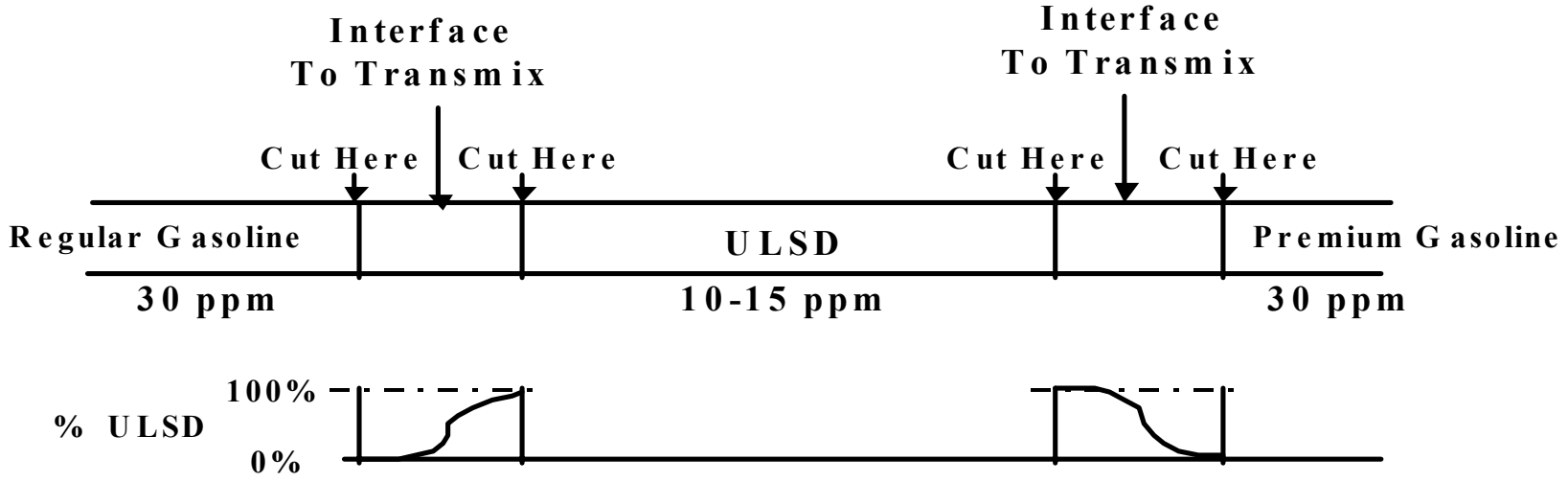


Interfaces are lost from both Gasoline and Diesel/Jet

DISTRIBUTION TUTORIAL

Product Integrity –Future ULSD/Gasoline Handling Procedures

- Example: ULSD is wrapped by Gasoline batches to protect quality
  - Cuts are made to preserve Gasoline and ULSD quality
  - Gasoline/ULSD Interface (Transmix) must be removed
  - Small amounts of Transmix can be reblended into Gasoline



If Interfaces remain at current sizes, the Transmix volume will double
Gasoline losses to transmix will at a minimum double

DISTRIBUTION TUTORIAL KEY POINTS

- **Front and Back Interfaces combined can be 3-10% of the batch volume**
- **Interfaces must be cut at breakout points and at the destination terminal which mean 2-4 cuts during typical movements but could be more often during long movements.**
- **Transmix/interface tankage will be necessary**
- **Transmix/interface will have to be reprocessed**
- **Transmix reprocessors will be unable to recover ULSD, the distillate portion of transmix must be downgraded to LSD or HSD**
- **Pipelines and terminals with only ULSD and HSD will downgrade interfaces to HSD**
- **Pipelines and terminals with only ULSD will not have a place for ULSD/Jet interfaces**
- **Each pipeline system is unique with different operations and different interface factors**